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THE EXPERIENCE OF THE SPRING VALLEY WATER COMPANY IN RESTRICTING THE WASTE OF WATER IN SAN FRANCISCO¹

By G. A. ELLIOTT²

The conservation of water in San Francisco is far more important than it is in any other city of similar size in the United States. The city is located at the extreme tip of a peninsula over 30 miles long, upon which a limited amount of water can be developed. The rainfall is limited, averaging a fraction over 22 inches a year. Due to its geographical isolation, its hilly topography and its scant rainfall, the problem of water supply is not only physically difficult, but is also very costly. An increase in the present developed supply involves the construction of about 60 miles of conduit. On two occasions in the past ten years, it has been expedient to reduce the waste of water to a minimum, the first time following the dry season of 1912-13, and the second time following the year of the Panama-Pacific Exposition.

In 1913 there were 63,016 services in actual use, of which 43,444 domestic supply services were on a flat-rate basis, and 19,572 devoted to business, industrial and hotel uses were metered. The water rate ordinance passed annually by the legislative board of the city prohibited metering domestic consumers except in extreme cases of wilful waste. Under these conditions, practically the only method that could be used for the restriction of waste was house to house inspection for leaks. This plan was followed out, and considering the fact that only out and out leaks could be controlled and not thoughtless or deliberate waste in the use of water, the results were surprisingly good.

Beginning in April and covering a period of eight months, a party of ten men equipped with aquaphones, made an examination of all the unmetered services in the system. The inspection was carried out between midnight and 5.00 a.m., the assumption being that any

¹ Discussions of this paper are requested and should be sent to the Editor.

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water flowing at that time was due to leaky plumbing. Following the night inspection, six day inspectors were used in visiting all premises which had been reported as leaking. These men definitely located the leaks and notified the owner to have repairs made. Two weeks after the day inspection, a second night examination was made and, if necessary, a second notice was served on the consumer. As a general rule, the second notice was not required, as repairs were made after the first warning. On the night work, each man examined 14 services an hour on an average. The day men, who were required to inspect all of the fixtures in a building and point out the leaks to the consumer, covered six houses per hour on the average.

A total of 43,444 premises inspected revealed that 25,419, or 58.6 per cent, had leaky plumbing. Up to the end of the year, when work was discontinued, repairs had been made in 23,372 cases, amounting to 92 per cent of the total number of leaks.

The result of this work on the consumption is shown in figure 1. In 1913 although the work was not commenced until April and the first inspection accompanied by notices to consumers was not completed until September, it was estimated that at least 1,200,000 gallons daily had been conserved. In 1914 the consumption was at least 3,000,000 gallons daily, or 8 per cent, below what it would have been if allowed to proceed unchecked. In 1915 the influence of the Panama-Pacific Exposition artificially increased the use to such proportions that the further effect of the inspection could not be determined.

In 1916, following the Exposition year, the daily consumption had reached a point where it was necessary to either increase the development or still further restrict the waste of water. The effect of the war on prices of water works materials was beginning to be felt. After careful consideration by all parties interested, it was decided to conserve the existing supply through the installation of meters on about one-half of the flat-rate services. The installation of meters on the remaining services was to be made at a later date, depending upon the effect of the first batch upon the consumption and the fixing of a meter rate for the sale of water. Work was commenced on August 1, 1916, and continuously prosecuted until March 30, 1917, when about 25,000 meters had been set.

Just a year later, anticipating the establishment of a temporary meter rate (which was finally fixed in September, 1918), the metering of the remaining 25,000 flat-rate services was commenced and car-

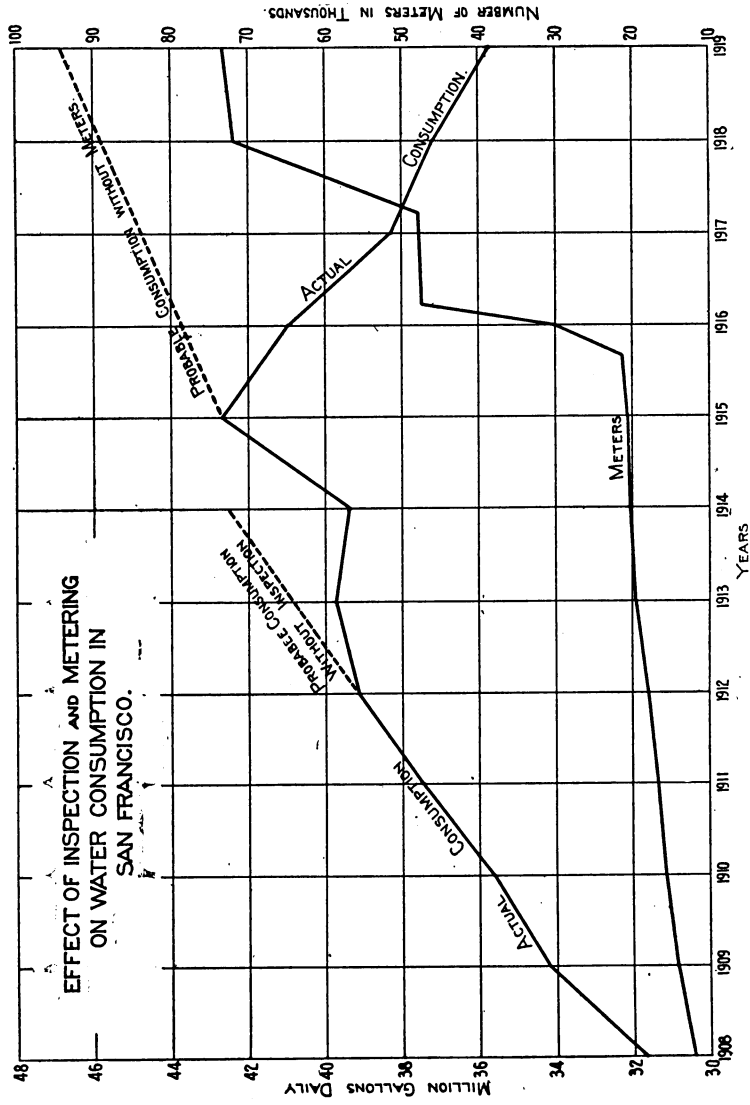


FIG. 1.—RESULTS OF WATER WASTE PREVENTATIVE MEASURES IN SAN FRANCISCO

ried on until in August, 1918, San Francisco was 100 per cent metered. The size and number of crews used varied, but in general it was found that the proper proportion of men was one-third pipe fitters and two-thirds common labor. The average number of meters set per crew man per day was 4.70.³ In this connection it must be remembered that many of the services had been in use for over forty years and that the location records had practically all been destroyed in the fire of 1906. In fact the wireless pipe locator was in constant use and saved a great deal of useless excavation.

The result of the meter installation on the consumption is shown graphically in figure 1. The outstanding feature of the diagram is the fact that the decrease in consumption has gone on over a four-year period, the estimated reduction for the year 1919 amounting to 12,000,000 gallons daily or 25 per cent of the probable unrestricted consumption. The rather long drawn out period of continually decreasing consumption is readily explained by the history of the case. Referring again to the diagram, it will be noticed that the period of setting the first batch of meters covered 1916 and 1917. The effective reduction in consumption up to the end of 1917 was due almost entirely to psychological reasons, as there was not a practical meter rate in effect during this time. While it is true that the waste clause of the old water-rate ordinance was in effect (providing that if the amount of water used in a month through a service exceeds by 50 per cent the number of cubic feet which at meter rates amounts to the consumer's flat rate bill, the Water Company may charge "at regular meter rates") the margin between necessary use and wasteful use as defined above was so great as to practically prohibit any effective monetary penalty for the latter.

In September, 1918, a temporary meter rate in the form recommended by the New England Water Works Association was authorized by the State Railroad Commission pending a final rate-fixing by that tribunal. The application of this rate to all consumers, together with the metering of the remaining open services, accounts for the continuation of the decrease in consumption up to the end of 1919. It is not likely that this decrease will continue beyond this year. Preliminary census figures indicate a population of 600,000 for San Francisco. On this basis the use of water in 1919 from the Company's system amounted to 60 gallons per person per day. The

³ Cost details are given in *Engineering News-Record*, May 9, 1918.

unaccounted-for water, (i.e., water used for fire purposes, street sprinkling, reservoir evaporation, leakage, etc.) for the last year was less than 22 per cent of the total amount withdrawn from the sources of supply.

The methods used and the physical and hydraulic facts attendant upon the wholesale installation of meters on an unmetered system, while of interest to the engineer or operator, are probably not as important as the effect of the new policy upon the public. This is true of both public utilities and municipally owned water works. While it is not difficult to convince the individual of the fairness of meters in the abstract as a means of properly allocating the water charges, it is an almost insurmountable task to convince the same man that justice is being done if his own bill is thereby increased. It was recognized that individual contact with all consumers was impossible, and that in the main they could only be addressed as a body. It was determined to conduct a campaign of education through the medium of the daily papers and the use of pamphlets, supplemented by talks to various civic associations.

Coupled with the advertising campaign a liberal policy in the matter of adjustments, especially on the first two monthly water bills following the inauguration of the meter charges, and the free service of the Company's inspection department in locating leaks in either house piping or fixtures, did much to tide over the period of changing from flat to meter rates. Full advantage was taken of the fact that the monthly bill collectors came in personal touch with the consumer in their house-to-house visits. All of these men were thoroughly drilled in the fundamentals of rate fixing and particularly in regard to the existing rate. Consumer's questions brought up new points for explanation each day and periodical gatherings of the collectors were held, at which the necessary information was given to them, to be in turn passed to the householder. This personal touch was of great value, as most of the collectors were well known to the customers through having covered the same route for years.

Still another important factor which was effective in securing the good will of the consumer was the changing of the existing meter to one of smaller size when the consumption permitted this procedure to be followed. The form of the rate bill was such that each consumer's monthly bill was made up of two parts: a "service charge" based on the size of the meter installed, varying from 65 cents per month for a $\frac{5}{8}$ -inch meter to \$40 a month for an 8-inch meter, plus a

charge for each 100 cubic feet of water used through the meter. The following somewhat arbitrary amounts were fixed as being the average monthly quantities to be used through meters of various sizes.

METER SIZE	MONTHLY QUANTITY	MONTHLY SERVICE CHARGE
<i>inches</i>	<i>gallons</i>	
$\frac{5}{8}$	4,000	\$0.65
$\frac{3}{4}$	7,000	1.00
1	12,000	1.50
$1\frac{1}{2}$	24,000	2.50
2	40,000	4.50
3	80,000	8.00
4	122,000	12.50
6	245,000	25.00
8	410,000	40.00

For instance, if it was noted that a consumer's 1-inch meter consistently read under 4000 gallons per month, a $\frac{5}{8}$ -inch meter would be set by the Company, thereby saving the user the difference in the service charge. In some instances it was possible to replace 2-inch meters with those of the smallest size, thereby effecting a considerable saving to the customer. Inasmuch as the ordinary water user is not sufficiently familiar with meter capacities to determine these facts for himself, this voluntary action of the Company resulted in a better mutual feeling.

The advertising feature was of such importance that a department was created for this purpose alone and placed under the direction of Edward F. O'Day, who had a varied experience as a newspaper and magazine writer. A series of advertisements running into the hundreds in number and extending over a period of eight months, was published in all of the daily papers. Naturally that part of the rate bill having to do with the "Service Charge" received the principal attention. Many of the consumers were under the impression that they were being charged a monthly rental for the meters; others that a certain amount of water should be delivered for the payment of this charge. The advertisements not only cleared up in the minds of many of the rate payers the method of allocating the components of the water rates, but drew forth many letters of inquiry. These letters were answered individually. It may be of interest to quote here a few typical replies.

A. Water is now sold entirely according to measured delivery. Formerly residential consumers paid a fixed monthly rate irrespective of the quantity drawn. The plan was responsible for many inequalities. There was practically no restriction on wasteful or excessive use. On the other hand, careful consumers had no opportunity to profit by their economy.

Under the meter schedule these matters automatically adjusted themselves, each user paying for actual delivery. Bills are large or small according to demand and condition of plumbing.

B. The service charge on water bills is a legitimate item duly passed on by the rate-fixing bodies, and represents not an additional charge but a division of the total cost.

The present schedule gives one value for the water in the mains to all, plus a service charge to the *individual*. As it costs as much to *deliver* water to a user of 100 cubic feet as to a user of 1000 cubic feet, the equity of this arrangement will be apparent.

C. It is unfortunate, but not conclusive of error or wrong, that the bills referred to by you are slightly higher than they were before. The opposite result will be produced on fully 50 per cent of all bills issued. With certain modifications the general effect will be that small users, to serve whom requires as heavy an investment as to serve large users, will pay somewhat more, the other class somewhat less.

D. The "service charge" item, which now appears on all water bills, represents that part of the total charge which covers the cost of installation, up-keep and administration.

The "delivery charge," on the other hand, represents the cost of accumulating the water and bringing it to the point of distribution. A base rate of 24 cents a hundred to all consumers has been set for the water in the mains; to this is added the service charge, which obviously remains the same whether the demand is large or small.

Formerly two rates were in effect: (1) flat rate for residential properties, based on area and equipment entirely, and not at all on use and occupancy; and (2) meter schedule for all other supplies, the base rate being 28½ cents a hundred cubic feet.

The flat rate was wrong because there was no relation between value given and revenue received. Some flat rate consumers paid too much, others too little; moreover, the consumer had no incentive either to exercise care in the use of water or to keep his plumbing in sound condition.

The old meter rate was wrong; first, because the minimum charge of \$1.80 a month made no allowance for the consumer who used 500 cubic feet of water a month or less, and secondly, because the sliding scale used was not in good balance, the load being placed on the intermediate user to the advantage of the very heavy consumer.

The present schedule, which is the result of much study and deliberation on the part of the rate experts and representatives of the City of San Francisco, the State Railroad Commission and the Spring Valley Water Company, while tentative, approximates the ideal rate for both consumer and company, is simple in application and logical in operation, the amount of the charge depending entirely on the quantity of water drawn, and not on any arbitrary factor, such as the size of the premises, etc.

The advertisements were so composed and arranged that while each was complete in itself, the entire series told a connected story. They began with the question of water supply in general, followed by a description of the local water supply, pointing out the ways and means used to supply San Francisco and touching on those features which involved special difficulties and unusual cost. The fundamen-



A Voluntary Adjustment

In big homes with spacious lawns, a complement of servants and several bath rooms, the consumption of water is sometimes very heavy.

It is not always possible, in such cases, for our service department to tell whether heavy meter registration is due to waste or to normal use.

Take for instance the water delivery for six months to a large house overlooking the Golden Gate:

	Consumption in Cubic Feet	Billing
June	9,300	\$21.17
July	6,000	18.44
August	11,600	26.90
September	29,700	64.01
October	1,800	4.97
November	1,700	4.73

In June, July and August delivery was heavy enough to suggest the possibility of waste or leakage, yet not altogether too heavy for the normal uses of so large a house.

But the September delivery of 29,700 cubic feet—222,750 gallons—removed all doubt. No home could consume that much water. Water was leaking to an enormous extent.

Note what happened when the leak was repaired. The October bill was \$4.97, as against \$64.01 for September.

We voluntarily made a liberal adjustment on those August and September bills, dividing the loss with the consumer.

Why?

Because it is our policy to encourage consumers to stop waste.

Because we don't care to charge for waste when a genuine effort is made to curtail it.

Because we value your good will and aim to give you "useful service."

SPRING VALLEY
WATER COMPANY



Sharing the Loss

Here is the record of water delivery to a householder in the northwestern section of the city:

	Cubic Feet Consumed	Amount
July 17.....	700	\$2.33
August 18.....	700	2.33
September 17.....	900	2.81
October 17.....	900	2.81
November 17.....	800	2.57
December 17.....	4,100	10.25

Two days after that last meter reading was taken, our service department sent that householder a letter, advising him to look for a leak.

A week later the householder wrote that a bad leak had been discovered and fixed.

Whereupon our service department wrote as follows:

"In line with our policy of absorbing one-half of the excess where water waste occurs through causes not under the consumer's knowledge or control, and where the consumer acts promptly in suppressing further loss, we are dividing with you the loss occasioned by leakage for the month ending December 17.

"This allowance is worked out as follows:

Value of delivery month ending Dec. 17.....	\$10.25
Value of average monthly consumption.....	2.57
Total excess	\$7.68
Allowance, one-half	3.84

"Credit for \$3.84 is shown on the adjusted bill enclosed herewith."

Our liberal policy of adjustments in such cases is part of our endeavor to render "useful service."

SPRING VALLEY
WATER COMPANY

FIG. 2—MUCH REDUCED COPIES OF TWO ADVERTISEMENTS

tals of rate fixing, discussing what must be considered in setting a price for the sale of water and giving the reasons for these considerations, were taken up next. This naturally brought the series to the subject of the various kinds of water rates and the meter rate in particular. Two samples of the advertisements are given in figure 2, and the text of a few more is reproduced here.

EQUITABLE BILLING

There are two items in your water bill—a charge for water, and a charge for the actual cost of service.

The charge for water depends on the number of cubic feet you use. The charge for service is the same every month.

If you are the average householder, you pay for water at the rate of 24 cents a hundred cubic feet (750 gallons). For the cost of service you pay 65 cents a month.

The charge for water is based on what it costs us to collect the water, impound it, keep it pure, convey it to San Francisco, and "lay it down" in front of your house.

The service charge is what it actually costs to connect your service pipe and meter, keep them in repair, read your meter, keep your account and collect your bill.

Your bill has been itemized this way ever since the complete metering of the city enabled us to compute exactly how much water each household consumes.

This form of bill is fairer than the old, and has advantages of which you should avail yourself. It has no advantage to us except the equitable distribution of charges.

Compare your water bills from month to month. If the charge for water varies a good deal, you may be wasting water, or there may be a leak.

The old style bill was meant to be fair, but in most cases it was not.

Your present bill is businesslike, logical and just.

THE OLD WAY AND THE NEW

Under the old way of charging, with the service charge included in the lump sum of the bill, the base rate for water was 28.75 cents per hundred cubic feet as against 24 cents at present.

If you were a commercial consumer and paid meter rates, you never paid less than \$1.80 a month.

That was the minimum meter bill, and it included a service charge.

If you were a residential consumer, you paid according to size of house and lawn, and number of water fixtures.

The service charge was supposed to be included in your bill. Sometimes it wasn't, if your premises were small. Sometimes you were charged too much for service.

With the whole city metered, and a separate service charge, these inequalities have been ironed out.

The bills of some 40,000 of our 70,000 consumers have been reduced.

Surely a method of billing which reduces 64 per cent of the bills is an improvement.

If we went back to the old bill, without the separate service charge, nearly two-thirds of our consumers would pay larger bills.

PAYING FOR SERVICE

If you bought water at a city reservoir, paid cash for it, and carried it home—as you sometimes carry a purchase from the store—your water bill would be smaller.

The price you paid would depend on what it cost us to bring the water to San Francisco and sell it over the counter. Expenses which every consumer pays under present conditions would be eliminated. There would be no service pipes and meters to maintain, no meter reading, bookkeeping or bill collecting.

But you can't shop for water, and you wouldn't if you could. You want it to flow at good pressure the moment you turn on the faucet. You demand service.

When you have a purchase sent home you pay for service. Sometimes there is a direct delivery charge—usually the charge is absorbed in the price of the goods.

For water delivery you have to pay, too—but you pay directly, the charge being distinct from the rest of the bill. Why? Because the cost of service varies and cannot equitably be prorated. Each consumer is charged what it costs us to serve him—no more, no less.

There is a service charge hidden in almost every bill you pay.
It is not hidden, it is where you can see it, in your water bill.

YOU MUST HAVE SERVICE

A consumer writes us this note:

"I don't understand the service charge of 65 cents. I never ordered service. All I want is water."

This consumer does not stop to think that the water business is like any other business.

Take the coal business.

All you want from your coalman is coal, but you expect him to haul it to your sidewalk and dump it in your cellar.

All you want from us is water, but you expect us to supply it in a way that suits your convenience.

You not only pay the coalman for coal, but you help to pay the wages of his truck driver, bookkeeper and bill collector. That's service charge in the coal business.

You not only pay us for water, but you pay for the maintenance and repair of your service pipe and meter, for meter reading, billing and collecting. That's service charge in the water business.

The coalman includes his service charge in the price per ton.

The water schedule separates service charge from the price per cubic foot. In both cases you get service and must pay for it.

A ton of coal dumped in the middle of the street wouldn't do you much good. If we didn't give you service how would the water get into your house?

NOT A METER RENTAL

There is an idea in some quarters that "service charge" is the same as "meter rental."

Insofar as the service charge for water in this city is concerned, this is a mistake.

You pay no rental for your water meter.

The service charge is a cost charge, not a rental charge. It represents the cost of serving you individually with water.

We have always charged for service, even before meters were installed throughout the city.

In theory every consumer was supposed to pay his share of the cost of service. In practice this was not the case.

Such was the inequality of the old way of billing that some paid nothing for service, some paid only a fraction of the cost, and others paid too much.

At present the service charge is figured separately from the water charge, and every consumer pays what his individual service costs.

The charge depends on the size of the meter.

But nobody who understands the service charge will mistake it for a meter rental.

IT CAN'T BE ABOLISHED

We have heard the remark that the service charge for water should be abolished.

People who say that don't understand the situation.

You can't abolish the service charge any more than you can eliminate from the water business the expenses which the service charge represents.

It's an unavoidable charge, and consumers have always paid it, and always will.

But sometimes they have paid it on a basis that was not entirely fair to them individually.

The service charge is inseparable from the water business. Of course it can be hidden—absorbed—combined with the rest of the bill. You can stop calling it the service charge.

There will be this difference—the water rate will be higher and not so equitable.

The old base rate was 28.75 cents, which included the cost of service. It is now 24 cents per 100 cubic feet, and you pay for service as a separate item.

This is fairer to you, but the results to us are almost the same.

The change was made in the interest of the consumers, not to benefit us.

THE CASE OF JOHN SMITH

John Smith has a tiny cottage. He uses very little water—about 100 cubic feet a month.

When flat rates were in effect, his bill was 25 cents a month.

Under the meter rates he pays 24 cents for water plus 65 cents service charge—89 cents a month.

John Smith used to pay for water only—we served him for nothing.

There were about 2,000 consumers in San Francisco who paid from 25 to 75 cents a month under the old flat rates. We served them at a loss.

On the other hand some consumers paid more than they should. They paid enough more to make up our loss on those 2,000.

Making a separate service charge has corrected all that inequality.

Of course, John Smith does not like to pay 89 cents a month instead of 25. But we assume that he's a fair-minded man, and doesn't expect to get water at a price so much below its cost that others must make up the loss.

Each consumer now pays his fair share. One does not carry another's burden.

READ YOUR WATER METER

"The lowly meter is regarded by some householders with distrust, but is in reality a faithful servant."

The speaker who made this statement at a Los Angeles convention of public utility officials, urged a campaign to educate consumers to read their meters and "thus obviate heated discussions between consumers and companies over the question of whether meter readings are correct."

The Spring Valley Water Company has pursued a consistent policy of co-operation with consumers who desired to inform themselves about the water meter, with the result that complaints on the subject are extremely rare.

Domestic consumers have paid meter bills a little more than a year. At first some were inclined to regard the meter with distrust. But at present the accuracy of the measuring machine is generally understood. The reason is that we have taken pains to explain the meter, to meet complaints courteously and to keep in mind that utility service should mean "useful service."

We have shown thousands of consumers that leaks were responsible for abnormal water bills, not the inaccuracy of the meter.

We have urged householders and other consumers to read their meters, and thus keep track of water consumption, pointing out that where the meter is read every few days, leakage is discovered and may be checked before it affects the bill. The meter is a great leak detector.

During the past six months we have distributed more than ten thousand copies of a folder entitled "A Check on Waste." This folder explains the meter dial and gives simple directions how to read it. There is a ruled space for a record of meter readings.

The consumer who reads his meter is in a position to verify his water bill. He does not think of the meter with distrust. He has no occasion to enter into "heated discussions" over the correctness of meter readings. He is making his water meter serve him to the fullest extent.

Write or call for a copy of "A Check on Waste," and learn to read your meter.

A CASE OF INSOMNIA

Running water as a remedy for insomnia!

This was the most curious case in our experience.

It happened in an apartment house. The water bill was abnormally large. So a thorough inspection was made.

The heavy waste of water was traced to a tenant who kept the faucet flowing full head in the bath tub every night. He explained that he had to do this because the sound of running water was the only thing that would make him sleep! Perhaps he was a retired sailor.

As the enormous waste of water meant no money out of his pocket, he slept soundly every night. If the landlord had insomnia, he should worry!

But when the landlord got through with him, he decided to seek some less expensive cure for sleeplessness.

A good deal of water is lost through wanton waste of this sort, but the really serious losses are caused by leaking fixtures.

The commonest cause of heavy loss is toilet leakage. There's a reason for this. A leaking faucet is a nuisance, and you generally lose no time in getting a new washer. But a toilet may leak badly without your being aware of it.

If your bill takes a sudden jump, and you know you haven't used more water than usual, notify our service department.

Our inspectors are making constant warfare on leaks. Every day they are helping consumers to reduce their bills. Maybe they can help you.

Let our service department show you that with us utility service means "useful service."

"FAIRLY CAREFUL"

When the consumer who is "fairly careful" gets his water bill, he says: "This bill seems to be about right."

And yet, owing to leakage, his bill may be growing a little larger every month. The chances are, he doesn't wake up until it is twice as large as it should be.

Take the case of this shopkeeper:

	<i>Cubic feet consumed</i>	<i>Water bill</i>
March.....	4,000	\$10.39
April.....	4,100	10.60
May.....	6,300	15.22
June.....	7,700	18.16
July.....	8,100	19.00
August.....	10,000	22.99
September.....	4,500	11.44
October.....	4,200	10.81

This consumer had use for the same amount of water, more or less, during all these eight months.

In May his bill went up, but being "fairly careful," he thought it was "about right."

But when in August it was more than double what it used to be, he realized that something was wrong.

While he was thinking of making a complaint, our service department made a voluntary investigation and found a blind leak.

As soon as it was repaired, the bills were normal again.

If this consumer had kept close tab on his meter readings—if he had profited by our folder, "A Check on Waste"—he would have found that leak before it got bad.

To save money nowadays you have to be *extremely careful* about all your bills, including your water bill.

It is now somewhat over a year since the meter rate was first applied, and the policy of frankly placing before the consumers the reasons for meter rates has fully justified itself through the results obtained. Opposition to and criticism of the meter rate has practically disappeared. Consumers have been encouraged to read their own meters and thus discover unusual registration, usually due to leaks. It can safely be said that at the present time the majority of the consumers are better satisfied with the meter rate than they were with the flat rate.